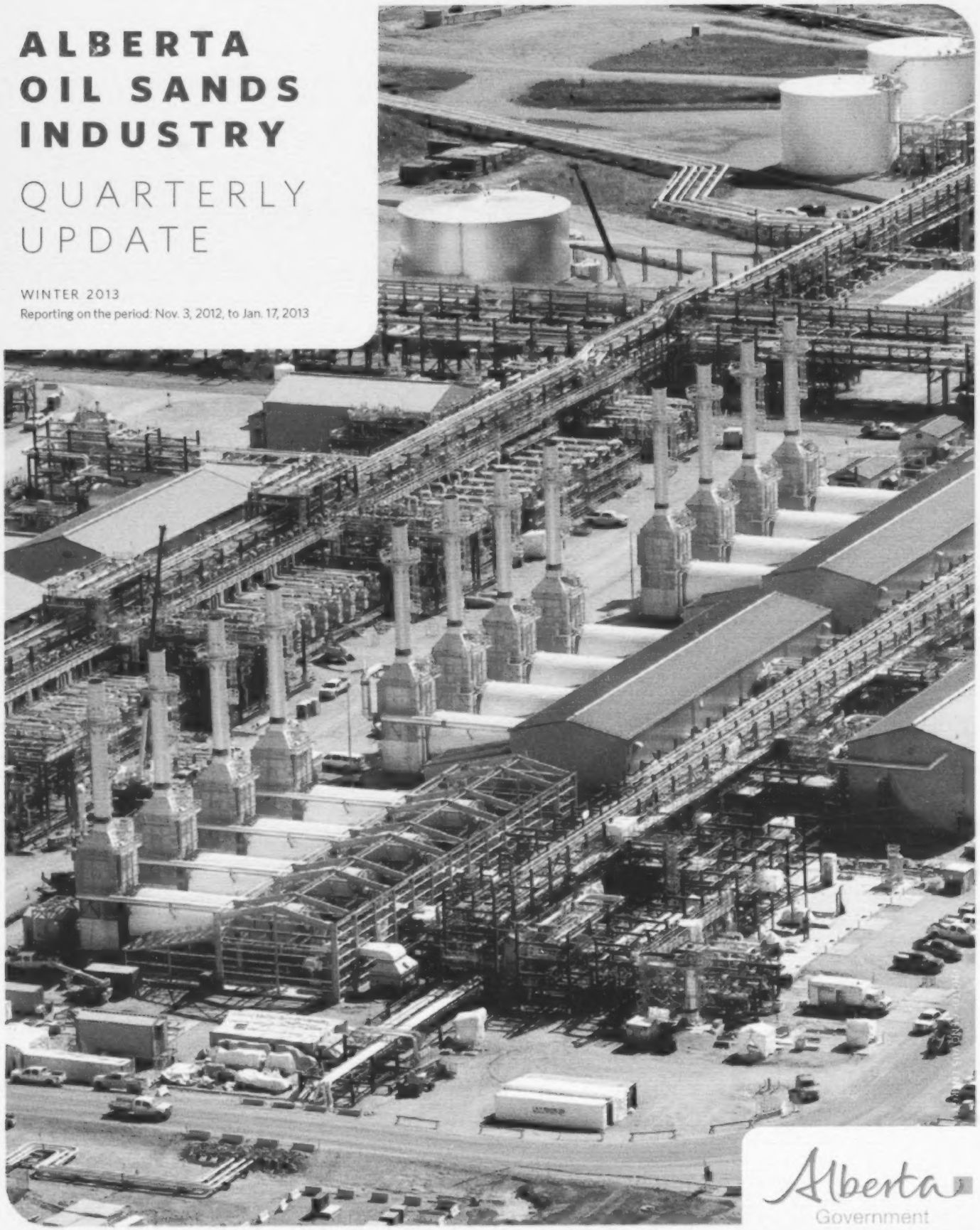
ALBERTA OIL SANDS INDUSTRY

QUARTERLY UPDATE

WINTER 2013

Reporting on the period: Nov. 3, 2012, to Jan. 17, 2013



Alberta Government

All about the oil sands

Background of an important global resource

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Canada has the third-largest oil reserves in the world, after Saudi Arabia and Venezuela. Of Canada's 174 billion barrels of oil reserves, 170 billion barrels are located in Alberta, and about 169 billion barrels are recoverable from bitumen. This is a resource that has been developed for decades but is now gaining increased global attention as conventional supplies—so-called "easy" oil—continue to be depleted. The figure of 169 billion barrels of bitumen represents what is considered economically recoverable with today's technology, but with new technologies, this reserve estimate could be significantly increased. In fact, total oil sands reserves in place are estimated at 1.8 trillion barrels.

There are three major bitumen (or oil sands) deposits in Alberta. The largest is the Athabasca deposit, which is located in the province's northeast in the Regional Municipality of Wood Buffalo. The main population centre of the Athabasca deposit is Fort McMurray. The second-largest oil sands deposit is referred to as Cold Lake, just south of Athabasca, with the main population centre the City of Cold Lake. The smallest oil sands deposit is known as Peace River, which is located in northwest-central Alberta. A fourth deposit called Wabasca links to the Athabasca and is generally lumped in with that area.

The existence of bitumen in Alberta has been known for a long time. The first mention of it in Canadian history was in 1719, when a Cree named Wapasu brought a sample of the "gum" to a Hudson's Bay trading post. First Nations in what is now the Wood Buffalo area had traditionally used the bitumen, which seeps from outcrops along the Athabasca River, to waterproof their canoes.

Today, bitumen is produced as an energy source by two means—mining and in situ. In 2011, 51 per cent of oil sands production came from mines, but by 2015, in situ bitumen production is expected to surpass mined bitumen production. Alberta will need to rely to a greater extent on in situ production in the future, as 80 per cent of the province's proven bitumen reserves are too deep underground to recover using mining methods.

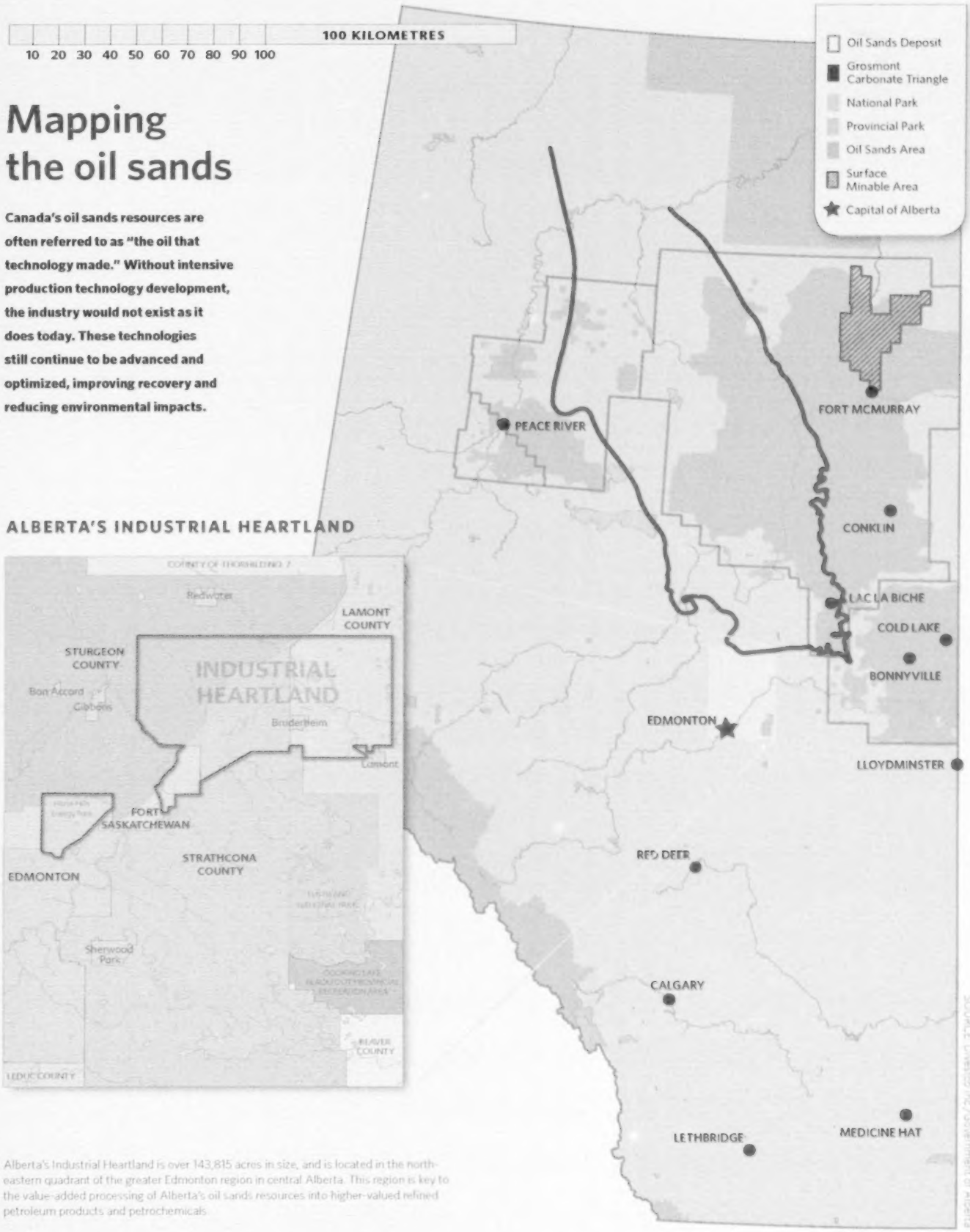
There are essentially two commercial methods of in situ (Latin for "in place," essentially meaning wells are used rather than trucks and shovels). In cyclic steam stimulation (CSS), high-pressure steam is injected into directional wells drilled from pads for a period of time, then the steam is left to soak in the reservoir for a period, melting the bitumen, and then the same wells are switched into production mode, bringing the bitumen to the surface.

In steam assisted gravity drainage (SAGD), parallel horizontal well pairs are drilled from well pads at the surface. One is drilled near the top of the target reservoir, while the other is drilled near its bottom. Steam is injected into the top well, a steam chamber forms, and the melted bitumen flows into the lower well via gravity and is pumped to the surface using artificial lift.

Both SAGD and CSS are used in the Cold Lake and Peace River deposits, while SAGD is the in situ technology of choice in the Athabasca deposit. The selection is based on a number of factors, including geology. The technologies combined currently produce just over one million barrels per day.

Research is underway on a number of other production technologies designed to optimize production, including variations on solvent-assisted SAGD and CSS, recovery using electricity, and in situ combustion.

Bitumen that has not been processed, or "upgraded," can be used directly as asphalt. It must be diluted to travel by pipeline. Adding value, some producers upgrade their product into synthetic crude oil, which is a refinery feedstock. That can be transformed into transportation fuels and other products. ■



Mapping the oil sands

Canada's oil sands resources are often referred to as "the oil that technology made." Without intensive production technology development, the industry would not exist as it does today. These technologies still continue to be advanced and optimized, improving recovery and reducing environmental impacts.

Alberta's Industrial Heartland is over 143,815 acres in size, and is located in the north-eastern quadrant of the greater Edmonton region in central Alberta. This region is key to the value-added processing of Alberta's oil sands resources into higher-valued refined petroleum products and petrochemicals.

SOURCE: Divestco Inc./Government of Alberta

GOVERNMENT UPDATE

ALBERTANS TO BENEFIT FROM NEW ENERGY REGULATOR

The Government of Alberta is protecting the participation rights of landowners while ensuring that industry has a more efficient and effective regulatory process. The Responsible Energy Development Act will create a single regulator for oil, gas, oil sands and coal development in the province.

This legislation is the result of years of consulting with Albertans and acts on recommendations the Regulatory Enhancement Task Force made two years ago.

"The Responsible Energy Development Act achieves the right balance—it improves the participation rights of landowners, it provides regulatory certainty for energy companies and it upholds our long-standing commitment to the environment," says Energy Minister Ken Hughes. "The single regulatory approach is something this province needs and this is the right time; the result will be a benefit to Alberta's economy and to Canada's economy."

During debate, Hughes proposed amendments that would strengthen the bill and further protect landowner rights. The Legislature endorsed those amendments, which include:

- Strengthening landowner rights by ensuring the regulatory agency takes their interests into consideration when an application is made;
- Requiring the regulatory agency to give public notice for all project applications it receives;
- Adding the ability for any person who believes they are directly and adversely affected by an application to file a statement of concern with the regulator; and
- Clarity around the appeal mechanism that is in place, to support fair decision making.

The legislation authorizes the new Alberta Energy Regulator to assume the regulatory functions of the Energy Resources Conservation Board (ERCB) and Alberta Environment and Sustainable Resource Development with respect to oil, gas, oil sands and coal development. The arm's-length body will be governed by a board of directors with a chief executive officer at the helm. A transparent and accountable appeals process will be established, and hearings will be conducted by independent hearing commissioners overseeing the process. Albertans will retain access to the courts. The Alberta Energy Regulator is expected to be operational by June 2013.

PREMIER REDFORD SAYS INVESTMENT APPROVALS GOOD BUSINESS DECISION

Alberta Premier Alison Redford has responded to the federal determination that proposed acquisitions of Nexen Inc. by the China National Offshore Oil Company and Progress Energy by PETRONAS, are of a net benefit to Canada:

"Alberta has worked hard to attract foreign investment to our province. We are pleased that the federal government appears to have listened to our input and made a careful examination of the circumstances unique to these proposed arrangements, as did my Government, and came to the same conclusion: the benefits are great, and any issues can be mitigated.

"Responsible investment in our resources is critical to maintain the high quality of life enjoyed by Albertans and Canadians. Canada has abundant resources that require significant investment to develop. Many sources of major capital are required.

"We will discuss this announcement with the federal government and study the implications of the statements about future investments by state-owned enterprises. As owners of the oil sands resource, we believe we have a stake in the decisions that affect the development of those resources. We will seek clarity on how 'exceptional circumstances' will be defined.

"All investors, whether foreign or domestic, private or state-owned, must comply with existing Canadian and Alberta laws if they wish to operate here. Alberta owns, and will continue to own, the natural resources within its borders. And rightly, there are exceptional considerations for investments by state-owned enterprises that were addressed during the federal review process."

PREMIER PLEASED WITH NEBRASKA'S APPROVAL OF KEYSTONE ROUTE

Alberta Premier Alison Redford provided the following statement in response to Nebraska Governor Dave Heineman's approval of the alternate Keystone XL pipeline route:

"On behalf of the Government of Alberta, I welcome Governor Heineman's decision to permit the routing of the Keystone XL pipeline through his state.

"Alberta recognizes the hard work that Nebraska has put into reviewing the new route to ensure that the final approval responded to the interests and concerns of Nebraskans.

"We were pleased to see the Governor carefully reviewed a state report that concluded environmental concerns were minimal, economic benefits to his state were high and that a pipeline carrying oil sands crude should not be treated differently than any other crude.

"We respect and understand that approval of the pipeline is a U.S. domestic matter and that this is just one step in the process that will ultimately be decided by the president.

"Continued and new market access for Alberta's globally important crude resources is the single-most critical issue facing our province.

"As our largest trading partner, our neighbour and our friend, we will continue to promote the importance of Alberta's resources as a critical component in helping to achieve North American energy independence and economic security."

DIRECTIVE 81—WATER DISPOSAL LIMITS AND REPORTING REQUIREMENTS FOR THERMAL IN SITU OIL SANDS SCHEMES RELEASED

The ERCB has announced the release of Directive 081: *Water Disposal Limits and Reporting Requirements for Thermal In Situ Oil Sands Schemes*, which consolidates various aspects of water-management requirements for thermal in situ oil sands schemes. The directive sets out water disposal limits and requirements for water reporting to PETRINEX. The disposal limits will require operators to recycle produced water efficiently and ensure that all make-up sources are effectively used. Frequently Asked Questions and Stakeholder Feedback and ERCB Responses on the draft directive are also made available on the ERCB website.

ERCB IFCO[Emphasis Information Letter (IL) 89-05: *Water Recycle Guidelines and Water Use Information—Reporting for In Situ Oil Sands Facilities in Albertalf CC*], and ERCB Bulletin 2006-11: *Water Recycle, Reporting and Balancing Information for In Situ Thermal Schemes* are rescinded simultaneous with the release of this directive.

KEY FEATURES OF THE DIRECTIVE

- Introduces the disposal limit formula, which sets an annual water-disposal limit unique to each thermal in situ oil sands scheme;

- Allows three years for existing schemes to meet the disposal limit;
- Provides detailed requirements for determining an accurate monthly water imbalance at thermal injection facilities, and includes illustrative examples; and
- Sets a maximum monthly facility water imbalance at each thermal injection facility, to ensure accurate measurement and reporting of water and steam volumes.

THERMAL IN SITU (TIS) WATER PUBLICATION

In conjunction with the directive, the ERCB announces a new, interactive website publication of monthly and annual water use at all commercial thermal in situ schemes. The TIS water publication includes the following, on a scheme basis:

- Water disposal limits and actual water disposal;
- Produced water recycle and produced water-to-steam injection ratios;
- Water productivity ratios (fresh water, brackish water and disposal); and
- Make-up water use.

In addition to the above, data used in the publication can be exported by users to an Excel spreadsheet.

The publication is available on the ERCB website (http://www.ercb.ca/data-and-publications/activity-and-data/thermal-insitu), along with Frequently Asked Questions to assist users.

EUROPE MISSION TO FOCUS ON STRENGTHENED MARKET ACCESS

Maintaining and enhancing market access for Alberta's products and services, as well as sharing an ongoing commitment to strong, fair and transparent environmental policy, were the key focus as two ministers embarked on an advocacy, trade and investment mission to Europe from January 14–26.

International and Intergovernmental Relations Minister Cal Dallas and Environment and Sustainable Resource Development Minister Diana McQueen were to travel separately to targeted European capitals to share information about Alberta's ongoing commitment to world-leading responsible energy development, while highlighting the province's fertile and responsible investment climate.

The ministers planned also to meet with government representatives, business leaders and media in an effort to provide input into the proposed implementation of the European Fuel Quality Directive (FQD) that Alberta believes lacks the transparency needed to be fully effective and unfairly discriminates against oil sands crude.

"Our province has always supported the intent of the FQD and its carbon reduction targets. We are fully prepared to have our crude oil assessed against all other crudes—as long as it is on a fair and level playing field," said Minister Dallas. "It is imperative that Alberta continues to advocate on behalf of the environmental and economic interests of Albertans and Canadians."

European Union environment ministers are expected to vote on the proposed FQD implementation this spring.

The ministers will emphasize recent resource management actions that include an unprecedented commitment to openness and transparency of energy development through an online oil sands information portal, a world-leading oil sands monitoring program and arm's-length governance system, a pipeline safety review and a comprehensive land-use plan for the oil sands region.

The ministers will also speak to Alberta's accomplishment as the first North American jurisdiction to require action by all large industry to reduce emissions, purchase offsets or pay into a clean energy technology fund. ■

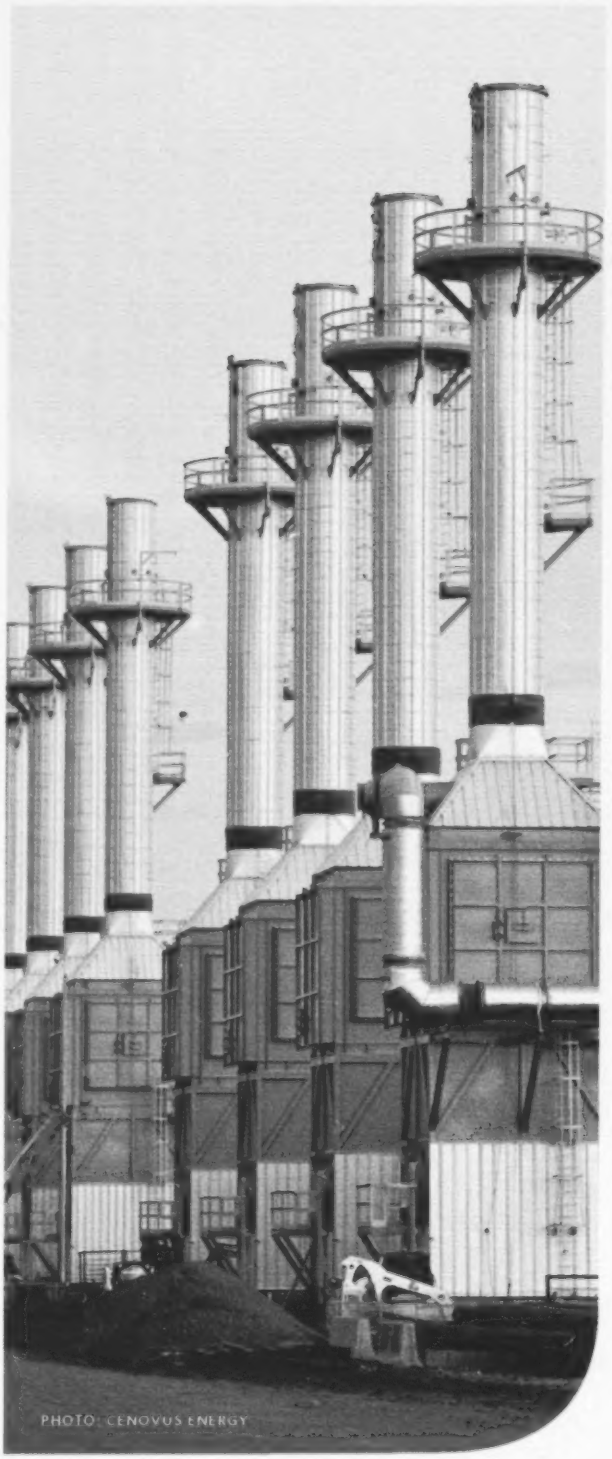


PHOTO: CENOVUS ENERGY

What's new in the oil sands

BUSINESS

Japan Petroleum Exploration Co. Ltd. (JAPEX) will begin development work immediately on its $1.4-billion Hangingstone thermal in situ project following a final investment decision made in December 2012 by the board of directors. Japan Canada Oil Sands Limited (JACOS), a consolidated subsidiary of JAPEX, currently produces 6,000–7,000 barrels of bitumen per day at its existing Hangingstone steam assisted gravity drainage (SAGD) project, which has been operating since 1999. It is one of the earliest SAGD projects in the oil sands.

With the front-end engineering design already completed and with regulatory approval for the scheme in November 2012, JACOS and partner Nexen Inc. will plan to undertake full-scale development work, aiming at production start-up in the first half of 2016.

Suncor Energy Inc. has achieved first production from the 62,500-barrel-per-day Firebag Stage 4 SAGD project, approximately three months ahead of the original schedule. The expansion comes hot on the heels of Firebag Stage 3, another 62,500-barrel-per-day expansion at the facility that achieved first oil in August 2011. The Firebag complex, which started operations in 2004, exited November 2012 producing approximately 130,000 barrels per day. That compares to production of about 70,000 barrels per day in November 2011. Suncor says the pace of production ramp-up at Firebag Stage 3 has exceeded previous expectations.

Based on the original plant execution of Firebag, combined phased production capacity should now be at 220,000 barrels per day. Due to actual performance of operations before Stage 3, Suncor has opted to revise down capacity to approximately 180,000 barrels per day up to and including Stage 4.

Husky Energy Inc. plans to file a regulatory application later in 2013 for a pilot test in Alberta's bitumen-rich carbonates.

The company estimates it has a contingent resource of 9.96 billion barrels of bitumen in carbonate rock at Saleski, where it plans to begin production by 2016. In total, Husky holds 975 square kilometres of land in Alberta's bitumen carbonates.

Estimates place the amount of bitumen locked in carbonate rock in the province to be in the range of hundreds of billions of barrels. Because of challenging geology, there has never been commercial production.

Grizzly Oil Sands ULC has submitted an application to Alberta regulators to build Thickwood, a $420-million thermal project employing both SAGD and cyclic steam stimulation technology.

The estimated cost of the project is $220 million for the first phase and $200 million for the second. Each phase will have a capacity of 6,000 barrels per day, with the second phase to be constructed three to five years after the first.

Surmont Energy Ltd. has retained Western Divestments Inc. to canvas the market for potential joint venture partners or acquisition proposals on its Wildwood oil sands project, located 70 kilometres south of Fort McMurray, Alta.

An application to build steam assisted gravity drainage facilities for the first 12,000-barrel-per-day phase of the Wildwood project was submitted to the Energy Resources Conservation Board in October 2012.

Birchwood Resource Inc. has applied to regulators for approval to build and operate Sage, a 5,000-barrel-per-day SAGD project in the Cold Lake region of Alberta. Birchwood believes that, while other companies in the area are operating projects of more than 50,000 barrels per day, Sage's small size will be the key to its success. Initial capital investment for this project is estimated to be $230 million, including $75 million for drilling, completing and well tie-in, and $155 million for surface facilities, equipment and infrastructure.

What's new in the oil sands

TECHNOLOGY

■ Laricina Energy Ltd. has decided to use a cyclic process instead of conventional steam assisted gravity drainage (SAGD) in its planned commercial development of bitumen-rich carbonates in the Grosmont.

To allow for the additional regulatory review time for the amended application, Laricina now estimates first steam will be injected at the Saleski project in the third quarter of 2015, pending approval. Laricina says capital costs are being reviewed to reflect the changes, but aren't expected to exceed the previous estimate of $660 million.

The project is operated and 60 per cent owned by Laricina. Osum Oil Sands Corp., another bitumen developer, owns the other 40 per cent.

■ A new sand-control system from an Alberta manufacturer could help lower steam to oil ratios in SAGD wells. Absolute Completion Technologies Ltd. unveiled its new AimRite system during a mid-October 2012 launch at its Edmonton factory. The new system could be a boon for oilsands producers eager to improve steam to oil ratios but concerned about erosion and sand production compromising the well, the company says.

AimRite—the name stands for autonomous inflow modulation—works by layering different filter media around the pipe. Numerous filter discs are drilled into the base pipe, which is then wrapped in a layer of steel wool mesh and held together by a perforated jacket. The combination allows the system to withstand higher flows of steam or liquids.

However, higher temperatures carry greater risks. Should the steam break through the outer mesh and threaten the integrity of the pipe, the system shuts down, preventing serious damage. This is because the filter discs will retain produced sand, automatically blocking flow on the well and stopping erosion.

■ ATCO Emissions Management is adding heat-recovery steam generators to its equipment lineup. In addition to power and cogeneration applications, the generators are intended for use at steam assisted gravity drainage production facilities, where they can be used to recover heat from a hot gas stream. Initially, the generators will be used with gas turbines up to 100 megawatts.

"The adoption of the generators will allow these institutions to be 'greener' and energy self-reliant," says Harry Wong, senior vice-president and general manager, ATCO Emissions Management.

■ Cenovus Energy Inc. says it has developed a drilling rig that can be flown by helicopter to remote areas, cutting out the need to build access roads and generating cost savings of about 25 per cent, or around $100 million per year.

The company has been working on the technology for two years and plans to submit its research to Canada's Oil Sands Innovation Alliance as its contribution to furthering the reduction of the oil sands industry's environmental footprint, says Harbir Chhina, Suncor's executive vice-president of oil sands.

"We don't need to have ice bridges, things like that," Chhina says. "At Borealis, we really couldn't do a [stratigraphic] well drilling program unless we had 40–50 wells, because you have to trigger camps and road access. With this rig, we can drill one, two, three, 50 wells—whatever we want."

■ Syncrude Canada Ltd. has signed up the modular fabricator that will be working on its new tailings management project: KBR Industrial Canada.

KBR will handle both module fabrication and field construction on Syncrude's Fluid Fine Tailings – Centrifuging Full Scale Plant. Work on the modules began late in 2012 and will continue until the end of 2013. Plant start-up is expected in 2015.

The plant will allow Syncrude to focus on reclaiming tailings from its surface mining project near Fort McMurray, Alta. A series of centrifuges will be used to separate water from solids in fluid fine tailings. The water will be recycled for use in plant operations, while the solids will be dense enough to be deposited, capped and reclaimed.

OIL SANDS PROJECT TECHNOLOGY GUIDE

CSS—CYCLIC STEAM STIMULATION

CSS involves injecting high-pressure steam into the reservoir for several weeks, followed by several weeks where the reservoir is left to "soak." The heat softens the bitumen and the water dilutes and separates the bitumen from the sand. The pressure creates cracks and openings through which the bitumen can flow back into the steam injector wells, which are converted to production mode.

ET-DSP—ELECTRO-THERMAL DYNAMIC STRIPPING

ET-DSP combines the majority of the dominant heat transfer mechanisms to heat and mobilize bitumen in situ. Electrodes are placed in a grid configuration and a production well is located within the centre of each series of electrode wells. The technology has been commercially applied for soil remediation and is expected to reduce greenhouse gas emissions and water use.

N-SOLV

N-Solv involves the injection of pure, heated solvent vapour into an oil sands reservoir where it condenses, delivering heat to the reservoir and subsequently dissolving the bitumen, with the resulting miscible liquids flowing by gravity to a production well. It is designed to accelerate extraction rates and reduce greenhouse gas emissions.

PRIMARY PRODUCTION—COLD HEAVY OIL PRODUCTION WITH SAND

Cold heavy oil production with sand (CHOPS) is a non-thermal in situ primary production technology that involves the continuous production of sand using progressing cavity pumps to enhance recovery.

SAGD—STEAM ASSISTED GRAVITY DRAINAGE

SAGD employs two parallel horizontal wells: one injection well near the top of the reservoir, through which high-pressure steam is continuously injected, and one production well near the bottom of the reservoir into which the softened bitumen continuously flows and can be pumped to the surface. SAGD surface facilities include steam generation, water processing and bitumen treatment. Multiple operators are also now working with solvent co-injection in SAGD to increase recovery and reduce natural gas and water requirements.

SURFACE MINING

Integrated oil sands mining operations accomplish three main functions: mining the oil sands, separating the bitumen from the sand and upgrading the bitumen so refiners can work with it.

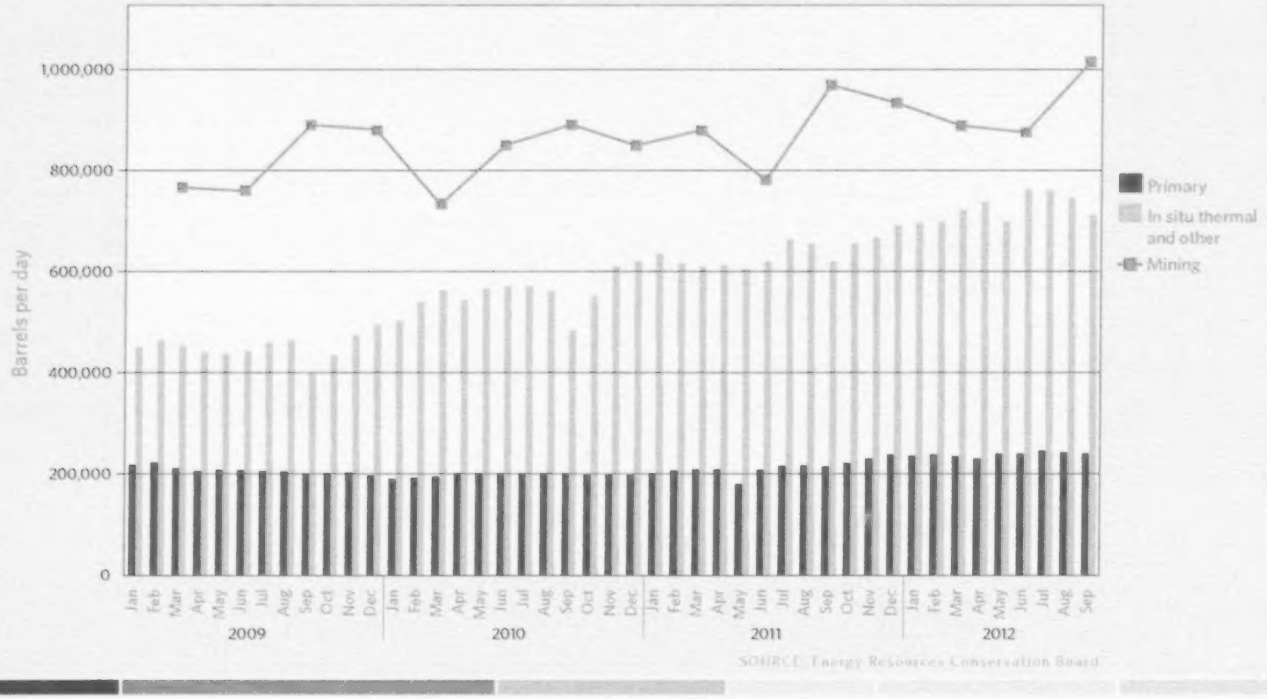
TAGD—THERMAL ASSISTED GRAVITY DRAINAGE

TAGD is a process being developed for the in situ recovery of bitumen from carbonate formations. TAGD uses an array of downhole heaters installed in horizontal wells to heat the reservoir via thermal conduction.

THAI—TOE TO HEEL AIR INJECTION

THAI uses a vertical air injection well with a horizontal production well. Rather than steam, THAI technology injects air and then relies on underground combustion of a portion of the oil in the ground to generate the heat required to melt the remainder of the bitumen and allow it to flow into the production well. The process is intended to reduce greenhouse gas emissions and water use.

Alberta Oil Sands Production by Extraction Method



SOURCE: Energy Resources Conservation Board

Project listings

Updated status of oil sands projects in Alberta

As of January 2013

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
NORTH ATHABASCA REGION — MINING				
CANADIAN NATURAL RESOURCES LIMITED				
Horizon				
Canadian Natural says it continues its strategy of staged expansion to 250,000 barrels per day and work remains on track. Projects currently under construction are trending at or below estimates.				
Phase 1	135,000	2008	Operating	Mining
Phase 2A	10,000	2014	Construction	Mining
Phase 2B	45,000	TBD	Approved	Mining
Phase 3	80,000	TBD	Approved	Mining
Tranche 2	5,000	2012	Operating	Mining
IMPERIAL OIL LIMITED				
Kearl				
Imperial Oil says that start-up of Kearl—which was supposed to start operating in December—is underway, but is delayed due to cold weather and earlier issues with transportation of modules from Korea.				
Phase 1	110,000	2013	Construction	Mining
Phase 2	110,000	2015	Construction	Mining
Phase 3 Debottleneck	70,000	2020	Approved	Mining
SHELL ALBIAN SANDS				
Jackpine				
A decision from the federal joint review panel on the Jackpine project is expected in May 2013.				
Expansion	100,000	2017	Application	Mining
Phase 1A	100,000	2010	Operating	Mining
Phase 1B	100,000	TBD	Approved	Mining
Muskeg River				
Shell reports that the Athabasca Oil Sands Project (Muskeg River and Jackpine) has now reached the milestone of 400 million barrels of cumulative production.				
Commercial	155,000	2002	Operating	Mining
Expansion & Debottlenecking	115,000	TBD	Approved	Mining
Pierre River				
A joint review panel of the Canadian Environmental Assessment Agency and Energy Resources Conservation Board has been established to review the proposed Pierre River mine project. The timeline for the joint review panel to submit its report is 550 days (18 months) from coming into force in July 2012.				
Phase 1	100,000	2018	Application	Mining
Phase 2	100,000	TBD	Application	Mining
SUNCOR ENERGY INC.				
Base Operations				
Suncor says it has started up its new Millennium Naphtha Unit and has run it at full rates. The unit is expected to stabilize secondary upgrading capacity and provide flexibility during maintenance activities for secondary upgrading units in the future.				
Millennium Debottlenecking	23,000	2008	Operating	Mining
Millennium Mine	294,000	1967	Operating	Mining
North Steepbank Extension	180,000	2012	Operating	Mining
Steepbank Debottleneck Phase 3	4,000	2007	Operating	Mining
Fort Hills				
Suncor and partner Total continue to review development timelines for Fort Hills.				
Debottleneck	25,000	TBD	Approved	Mining
Phase 1	165,000	2016	Approved	Mining
Voyageur South				
Suncor considers Voyageur South to be a "longer-term" project and has not confirmed a start-up date.				
Phase 1	120,000	TBD	Application	Mining
SYNCRUDE CANADA LTD.				
Mildred Lake/Aurora				
Syncrude has announced it is embarking on a new mine extension project at Mildred Lake, which will be known as the MLX project. Canadian Oil Sands says MLX will leverage investment in the two mine trains currently being constructed, enabling Syncrude to extend the life of Mildred Lake mining operations by about a decade. Project scoping is underway, and pending regulatory approval, construction and spending would commence in the next 10 years.				
Aurora South Train 1	100,000	2016	Approved	Mining
Aurora South Train 2	100,000	2018	Approved	Mining
Base Mine Stage 1 & 2 Expansion	290,700	1978	Operating	Mining
Stage 3 Expansion	116,300	2006	Operating	Mining
TECK RESOURCES LIMITED				
Frontier				
Teck says it received the final supplemental information requests relating to the Frontier regulatory application in Q3/2012 and anticipates responding in early 2013.				
Phase 1	75,000	2021	Application	Mining
Phase 2	80,000	2024	Application	Mining
Phase 3	80,000	2027	Application	Mining
Phase 4 Equinox	40,000	2030	Application	Mining
TOTAL E&P CANADA LTD.				
Joslyn North Mine				
Project partner Suncor Energy says submit development plans will be submitted to the companies' respective boards of directors for a sanctioning decision in 2013.				
Phase 1	100,000	2018	Approved	Mining
NORTH ATHABASCA REGION — IN SITU				
ATHABASCA OIL CORPORATION				
Birch				
AOS says $28.9 million was spent at Birch in the first nine months of 2012, mainly on drilling of one water and 22 delineation wells. In addition, the company shot 54 square kilometres of 3-D seismic. Winter delineation drilling and seismic programs are being evaluated for 2013.				
Phase 1	12,000	TBD	Announced	SAGD
Dover West Carbonates (Leduc)				
AOS says regulatory approval for the demonstration project is anticipated imminently. The design basis memorandum is complete and the engineering design specification work is well underway. Construction is also ongoing on a TAGD-related heater assembly facility near Strathmore, Alta.				
Phase 1 Demonstration	6,000	2015	Application	TAGD
Phase 2 Demonstration	6,000	TBD	Application	TAGD
Dover West Sands & Clastics				
In the first nine months of 2012, AOS acquired approximately 30,000 acres of oilsands leases contiguous to its existing Dover West assets. The company says its Dover West Sands project could now eventually support development up to 270,000 barrels per day. Regulatory approval and internal sanction for the first 12,000-barrel-per-day phase are expected in 2013. AOS says it is leveraging work done on FEED for its Hangingstone project for Dover West.				
Phase 1	12,000	2015	Application	SAGD
Phase 2	35,000	2018	Announced	SAGD
Phase 3	35,000	2020	Announced	SAGD
Phase 4	35,000	2022	Announced	SAGD
Phase 5	35,000	2024	Announced	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
BP P.L.C.				
Terre de Grace				
BP says that ongoing appraisal activities include delineation drilling, seismic acquisition and appraisal of water sources.				
Pilot	10,000	TBD	Approved	SAGD
CANADIAN NATURAL RESOURCES LIMITED				
Birch Mountain				
Canadian Natural says geological scoping is underway.				
Phase 1	60,000	2019	Announced	SAGD
Phase 2	60,000	2023	Announced	SAGD
CENOVUS ENERGY INC.				
East McMurray				
Phase 1	30,000	TBD	Announced	SAGD
Steepbank				
Phase 1	30,000	TBD	Announced	SAGD
Telephone Lake Borealis				
Cenovus says it continues to progress the Telephone Lake regulatory application while it operates its dewatering pilot, with water production and air injection proceeding as planned.				
Phase A	45,000	TBD	Application	SAGD
Phase B	45,000	TBD	Application	SAGD
DOVER OPERATING CORP.				
Dover				
Athabasca Oil Corporation is planning a likely sale of its stake in the Dover project to partner (and Dover OpCo owner PetroChina) once the previously determined decision trigger mechanism of regulatory approval is granted.				
Dover North Phase 1	50,000	2016	Application	SAGD
Dover North Phase 2	50,000	2018	Application	SAGD
Dover South Phase 3	50,000	2020	Application	SAGD
Dover South Phase 4	50,000	2022	Application	SAGD
Dover South Phase 5	50,000	2024	Application	SAGD
MacKay River				
ERCB project approval granted January 2012. Dover OpCo says construction is underway.				
Phase 1	35,000	2014	Construction	SAGD
Phase 2	40,000	2017	Approved	SAGD
Phase 3	40,000	2019	Approved	SAGD
Phase 4	35,000	TBD	Approved	SAGD
E-T ENERGY LTD.				
Poplar Creek				
E-T Energy has reinstated Bruce McGee as CEO based on his technological expertise as it works on pilot operations to support a new commercial project application. Its previous application was denied by the ERCB in 2012.				
Experimental Pilot	1,000	2007	Operating	ET-DSP
Phase 1	10,000	TBD	Announced	ET-DSP
Phase 2	40,000	TBD	Announced	ET-DSP
GRIZZLY OIL SANDS ULC				
Thickwood				
At the end of Q3/2012 Grizzly part owner Gulfport Energy said a regulatory application for the Thickwood project was expected by year-end 2012.				
Phase 1	10,000	2017	Application	SAGD
Phase 2	6,000	TBD	Application	SAGD
HUSKY ENERGY INC.				
Saleski				
Husky plans to submit a regulatory application for the Saleski project in 2013.				
Carbonate Pilot	TBD	2016	Announced	TBD
Sunrise				
Husky says Sunrise continues to meet its construction milestones and remains on schedule for first oil in 2014. All significant contracts for Phase 1, including the central processing facility, have now been converted to lump sum payment. Over 85 per cent of the project costs are now fixed. Planning, design and engineering for the next phase of development continues.				
Phase 1	60,000	2014	Construction	SAGD
Phase 2	50,000	2016	Approved	SAGD
Phase 3	50,000	TBD	Approved	SAGD
Phase 4	50,000	TBD	Approved	SAGD
IMPERIAL OIL LIMITED				
Aspen				
Phase 1	40,000	TBD	Announced	SAGD
IVANHOE ENERGY INC.				
Tamarack				
Ivanhoe is responding to a third round of supplemental information requests from regulators regarding its project application. Approval is now anticipated in 2013.				
Phase 1	20,000	2016	Application	SAGD
Phase 2	20,000	TBD	Application	SAGD
MARATHON OIL CORPORATION				
Birchwood				
Marathon said that based on results of completed appraisal drilling, a regulatory application would be filed in 2012.				
Demonstration	12,000	2016	Application	SAGD
N-SOLV CORPORATION				
Dover				
Reports are that first results from a $60-million N-Solv field test are expected in spring 2013.				
Demonstration Plant	500	2013	Construction	N-SOLV
OAK POINT ENERGY LTD.				
Lewis				
Pilot	1,720	2013	Application	SAGD
SILVERWILLOW ENERGY CORPORATION				
Audet				
SilverWillow says engineering consultants have been selected to prepare preliminary engineering design and cost estimates for Audet production facilities and infrastructure, to conduct environmental baseline studies and to provide support for the regulatory application, which is expected to be filed in the second half of 2013.				
Pilot	12,000	2016	Announced	SAGD
SOUTHERN PACIFIC RESOURCE CORP.				
STP McKay				
Southern Pacific says operations are progressing as planned, with the first of the well pairs now being converted from steam circulation to bitumen production.				
Phase 1	12,000	2012	Operating	SAGD
Phase 1 Expansion	6,000	2014	Application	SAGD
Phase 2A	12,000	2017	Application	SAGD
Phase 2B	6,000	2017	Application	SAGD
SUNCOR ENERGY INC.				
Firebag				
Suncor reports it has achieved first oil from Firebag Stage 4, approximately three months ahead of schedule. Production has now reached 130,000 barrels per day.				
Cogeneration and Expansion	25,000	2007	Operating	SAGD
Stage 1	35,000	2004	Operating	SAGD
Stage 2	35,000	2006	Operating	SAGD
Stage 3	62,500	2011	Operating	SAGD
Stage 3-6 Debottleneck	23,000	TBD	Application	SAGD
Stage 4	62,500	2013	Operating	SAGD
Stage 5	62,500	2018	Approved	SAGD
Stage 6	62,500	2019	Approved	SAGD
Lewis				
Phase 1	40,000	TBD	Application	SAGD
Phase 2	40,000	TBD	Application	SAGD
MacKay River				
MR2	40,000	2016	Application	SAGD
Phase 1	33,000	2002	Operating	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
SUNSHINE OILSANDS LTD.				
Harper				
Sunshine says that steam cycle injection operations at Harper have proved thermally induced oil mobility.				
Carbonate Pilot	1,000	2011	Operating	SAGD
Legend Lake				
Sunshine says regulatory approval for Legend Lake is anticipated in the first half of 2013.				
A Phase 1	10,000	2016	Application	SAGD
A Phase 2	20,000	TBD	Announced	SAGD
B Phase 1	20,000	TBD	Announced	SAGD
Thickwood				
Sunshine says FEED for Thickwood is approximately 10 per cent complete. Approval is anticipated in the first half of 2013.				
A Phase 1	10,000	2015	Application	SAGD
A Phase 2	20,000	2018	Announced	SAGD
B Phase 1	20,000	2021	Announced	SAGD
West Ells				
Sunshine says construction on West Ells remains on schedule and on budget. The access road is now complete and ready for heavy hauls, and pilings for the central processing facility have commenced. Some of the major equipment is in transit. Civil construction of the central processing facility is 40 per cent complete, with facilities engineering 75 per cent complete. The first SAGD well pair has been spudded.				
A Phase 1	5,000	2013	Construction	SAGD
A Phase 2	5,000	2014	Approved	SAGD
A Phase 3	20,000	2018	Announced	SAGD
B Phase 1	20,000	2020	Announced	SAGD
B Phase 2	20,000	TBD	Announced	SAGD
C Phase 1	30,000	TBD	Announced	SAGD
SOUTH ATHABASCA REGION — IN SITU				
ALBERTA OILSANDS INC.				
Clearwater West				
Alberta Oilsands says it has restructured key consultants to consolidate costs as it pushes to permit the Clearwater project. The company has retained Petrospec Engineering to spearhead and project manage the ongoing project application process with regulators.				
Phase 1 Pilot	4,350	TBD	Application	SAGD
Phase 2	25,000	2016	Announced	SAGD
ATHABASCA OIL CORPORATION				
Hangingstone				
AOS has sanctioned the first phase of its $536-million Hangingstone SAGD project at a projected cost of $44,700 per flowing barrel. SAGD drilling is expected to commence mid-2013.				
Phase 1	12,000	2014	Construction	SAGD
Phase 2	35,000	2017	Announced	SAGD
Phase 3	35,000	2019	Announced	SAGD
BLACKPEARL RESOURCES INC.				
Blackrod				
BlackPearl says its Blackrod SAGD pilot continues to operate in line with expectations. Regulatory approval has been received to drill a second horizontal well pair, which will be done Q1/2013. The project management team for the first commercial phase is being assembled and will determine the EPC contractor as one of its initial decisions.				
Phase 1	20,000	2015	Application	SAGD
Phase 2	30,000	2018	Application	SAGD
Phase 3	30,000	2021	Application	SAGD
Pilot	800	2011	Operating	SAGD
CANADIAN NATURAL RESOURCES LIMITED				
Gregoire Lake				
Canadian Natural says geological scoping is underway.				
Phase 1	40,000	2021	Announced	TBA
Phase 2	40,000	2025	Announced	TBA
Grouse				
Canadian Natural says timing of Grouse has been adjusted to accommodate the potential inclusion of recently acquired lands adjacent to the company's Kirby area and provide a more balanced capital expenditures profile going forward. First steam at Grouse is now expected between 2017 and 2019.				
Commercial	50,000	TBD	Application	SAGD
Kirby North				
Canadian Natural has budgeted approximately $205 million for Kirby North in 2013 to progress detailed engineering, order modules and construct camp facilities. Project sanction is targeted for the first half of 2013. To accommodate the acquisition of lands adjacent to the Kirby area that Canadian Natural may include in the project, first steam at Phase 1 is now anticipated in 2016.				
Phase 1	40,000	2016	Application	SAGD
Phase 2	40,000	2019	Application	SAGD
Kirby South				
Canadian Natural says construction of Phase 1 continues to progress ahead of plan and is now 74 per cent complete, with 89 per cent of capital expenditures committed.				
Phase 1	40,000	2013	Construction	SAGD
Phase 2	20,000	2020	Application	SAGD
CAVALIER ENERGY INC.				
Hoole				
Cavalier submitted the regulatory application for the first phase at Hoole in November 2012. Assuming regulatory approval and favourable market conditions, construction is expected to begin in 2014, with first production in 2015.				
Phase 1	10,000	2015	Application	SAGD
Phase 2	30,000	TBD	Announced	SAGD
Phase 3	30,000	TBD	Announced	SAGD
Phase 4	30,000	TBD	Announced	SAGD
CENOVUS ENERGY INC.				
Christina Lake				
Phase E is about 65 per cent complete, and Phase F construction is advancing. Engineering and design work is underway for Phase G, and Cenovus plans to file the regulatory application for Phase H in 2013.				
Future Optimization	12,000	TBD	Announced	SAGD
Phase 1A	10,000	2002	Operating	SAGD
Phase 1B	8,800	2008	Operating	SAGD
Phase C	40,000	2011	Operating	SAGD
Phase D	40,000	2012	Operating	SAGD
Phase E	40,000	2013	Construction	SAGD
Phase F	50,000	2016	Approved	SAGD
Phase G	50,000	2017	Approved	SAGD
Phase H	50,000	2019	Announced	SAGD
Foster Creek				
Phase F is now approximately 65 per cent complete, and Cenovus says progress continues to be made on G and H. The company plans to submit a regulatory application for Phase J in 2013.				
Future Optimization	15,000	TBD	Announced	SAGD
Phase A	24,000	2001	Operating	SAGD
Phase B Debottleneck	6,000	2003	Operating	SAGD
Phase C Stage 1	10,000	2005	Operating	SAGD
Phase C Stage 2	20,000	2007	Operating	SAGD
Phase D	30,000	2009	Operating	SAGD
Phase E	30,000	2009	Operating	SAGD
Phase F	45,000	2014	Construction	SAGD
Phase G	40,000	2015	Approved	SAGD
Phase H	40,000	2016	Approved	SAGD
Phase J	55,000	2019	Announced	SAGD
Narrows Lake				
Site preparation is underway, with construction of the Phase 1 plant scheduled to begin in Q3/2013.				
Phase 1	45,000	2017	Construction	SAGD
Phase 2	45,000	TBD	Approved	SAGD
Phase 3	40,000	TBD	Approved	SAGD
Pelican Lake Grand Rapids				
Cenovus says it anticipates regulatory approval for the commercial Grand Rapids pilot in 2013.				
Phase A	60,000	2017	Application	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
Phase B	60,000	TBD	Application	SAGD
Phase C	60,000	TBD	Application	SAGD
Pilot	600	2011	Operating	SAGD
West Kirby				
Phase 1	30,000	TBD	Announced	SAGD
Winefred Lake				
Phase 1	30,000	TBD	Announced	SAGD
CONNACHER OIL AND GAS LIMITED				
Algar				

Connacher has sold two subsidiaries for proceeds of approximately $200 million, which the company says positions it to "execute a meaningful capital program" including projects designed to increase production and improve netbacks at Algar and Great Divide Pod 1. This could increase production by as much as 5,000 barrels per day over the next 15–24 months.

Pod 2	10,000	2010	Operating	SAGD
Great Divide				

Connacher received regulatory approval for the two-phase, 24,000-barrel-per-day expansion at Great Divide in September 2012. The company says the approval allows it to advance its evaluation of project costs, timing and financing alternatives.

Expansion 1A	12,000	2014	Approved	SAGD
Expansion 1B	12,000	2016	Approved	SAGD
Pod 1	10,000	2007	Operating	SAGD
CONOCOPHILLIPS CANADA LIMITED				
Surmont				

ConocoPhillips Canada says engineering for Surmont 2 is expected to be complete and the majority of materials and equipment delivered to site by year-end, in anticipation of peak construction in 2013.

Phase 1	27,000	2007	Operating	SAGD
Phase 2	109,000	2015	Construction	SAGD
Pilot	1,200	1997	Operating	SAGD
DEVON CANADA CORPORATION				
Jackfish				

Devon says ramp-up of Jackfish 2 is now approximately two-thirds complete, while construction of the Jackfish 3 project is now approximately 40 per cent complete.

Phase 1	35,000	2007	Operating	SAGD
Phase 2	35,000	2011	Operating	SAGD
Phase 3	35,000	2015	Construction	SAGD
Jackfish East				
Expansion	20,000	2018	Announced	SAGD
Pike				

Devon filed the regulatory application for all three phases of the Pike project in June 2012. The company says facility construction and SAGD drilling for the first phase will begin in late 2013 or early 2014, pending corporate approvals. The company has also submitted its environmental impact assessment report for the project.

1A	35,000	2016	Application	SAGD
1B	35,000	2017	Application	SAGD
1C	35,000	2018	Application	SAGD
GRIZZLY OIL SANDS ULC				
Algar Lake				

Construction on the first phase at Algar reportedly remains on track for commissioning in Q1/2013 with first production by mid-year.

Phase 1	5,500	2013	Construction	SAGD
Phase 2	5,500	2014	Approved	SAGD
May River				

Grizzly says it anticipates full-field development of its May River asset to ultimately produce more than 75,000 barrels per day using SAGD and its ARMS development model. Part owner Gulfport Energy says 20–25 core holes will be drilled at May River this winter, following which sufficient exploration will have occured to submit the SAGD application.

Phase 1	6,800	TBD	Announced	SAGD
Phase 2	6,800	TBD	Announced	SAGD
HARVEST OPERATIONS CORP.				
BlackGold				

Harvest says 15 SAGD well pairs have now been drilled, and engineering is now 80 per cent complete. The site has been cleared and graded and now piling and foundation work is underway. Phase 2 of the project is now in the regulatory process, with approval now anticipated in 2013.

Phase 1	10,000	2014	Construction	SAGD
Phase 2	20,000	TBD	Application	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
HUSKY ENERGY INC.				
McMullen				

Husky says that 32 slant wells have been drilled for primary production development at McMullen. The company says the air injection pilot is continuing as planned, with further testing planned for Q4/2012.

Air Injection Pilot: Experimental	755	2012	Construction	SAGD
JAPAN CANADA OIL SANDS LIMITED				
Hangingstone				

Japan Canada Oil Sands owner JAPEX has sanctioned the Hangingstone expansion project. Project partner Nexen is expected to sanction its share of the development early in 2013.

Expansion	35,000	2016	Application	SAGD
Hangingstone Pilot				
Pilot	11,000	1999	Operating	SAGD
KOCH EXPLORATION CANADA CORPORATION				
Muskwa				

Koch's Canadian subsidiaries are seeking a strategic investor to advance development and monetize certain oil sands interests including the Muskwa asset.

Pilot	10,000	2015	Application	SAGD
LARICINA ENERGY LTD.				
Germain				

Laricina says Germain construction continues on time and on budget. Detailed engineering is complete, approximately 60 per cent of modules have been installed and 80 per cent of module fabrication is complete. Regulatory consultation for the 150,000-barrel-per-day expansion is continuing as planned, and approval is anticipated in 2013.

Phase 1 CDP	5,000	2013	Construction	SAGD
Phase 2	30,000	2015	Application	SAGD
Phase 3	60,000	TBD	Application	SAGD
Phase 4	60,000	TBD	Application	SAGD
Saleski				

Laricina has filed a project update to the Saleski Phase 1 regulatory application to reflect the change of well configuration to a single horizontal well cyclic SAGD from a dual-well SAGD process.

Experimental Pilot	1,800	2011	Operating	SAGD
Phase 1	10,700	2015	Application	SAGD
MEG ENERGY CORPORATION				
Christina Lake				

MEG anticipates it will increase production at Christina Lake by about 20 per cent in 2013 compared to 2012 thanks to its RISER initiative (which includes enhanced modified steam and gas push), and start-up of Phase 2B in the second half of the year.

Phase 1 Pilot	3,000	2008	Operating	SAGD
Phase 2A	22,000	2009	Operating	SAGD
Phase 2B	35,000	2013	Construction	SAGD
Phase 3A	50,000	2016	Approved	SAGD
Phase 3B	50,000	2018	Approved	SAGD
Phase 3C	50,000	2020	Approved	SAGD
Surmont				

MEG's environmental impact assessment report for Surmont was filed in late October, while the regulatory application was filed in September. Public consultation is ongoing.

Phase 1	41,000	2018	Application	SAGD
Phase 2	41,000	TBD	Application	SAGD
Phase 3	41,000	TBD	Application	SAGD
NEXEN INC.				
Long Lake				

CNOOC's bid to acquire Nexen has been approved by the Canadian government and is expected to close imminently.

Long Lake South (Kinosis) Phase 1	40,000	TBD	Approved	SAGD
Long Lake South (Kinosis) Phase 2	40,000	TBD	Approved	SAGD
Phase 1	72,000	2008	Operating	SAGD
Phase 2	72,000	TBD	Approved	SAGD
Phase 3	72,000	TBD	Application	SAGD
Phase 4	72,000	TBD	Announced	SAGD

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
OSUM OIL SANDS CORP.				
Sepiko Kesik				
Phase 1	30,000	2018	Announced	SAGD
Phase 2	30,000	TBD	Announced	SAGD
STATOIL				
Kai Kos Dehseh				
Statoil says its next projects will be an expansion to Leismer and the Corner project. Corner will be sanctioned late in 2013 or early in 2014. The company has appointed a new president of its Canadian operations, Stale Tungesvik.				
Corner	40,000	2017	Approved	SAGD
Corner Expansion	40,000	TBD	Application	SAGD
Hangingstone	20,000	TBD	Application	SAGD
Leismer Commercial	10,000	TBD	Approved	SAGD
Leismer Demonstration	10,000	2010	Operating	SAGD
Leismer Expansion	20,000	TBD	Approved	SAGD
Leismer Northwest	20,000	TBD	Application	SAGD
Leismer South	20,000	TBD	Application	SAGD
Thornbury	40,000	TBD	Application	SAGD
Thornbury Expansion	20,000	TBD	Application	SAGD
SUNCOR ENERGY INC.				
Chard				
Phase 1	40,000	TBD	Announced	SAGD
Meadow Creek				
Phase 1	40,000	TBD	Approved	SAGD
Phase 2	40,000	TBD	Approved	SAGD
SURMONT ENERGY LTD.				
Wildwood				
Surmont filed its regulatory application in early October, almost exactly one year after being incorporated as a company.				
Phase 1	12,000	2015	Application	SAGD
VALUE CREATION INC.				
Advanced TriStar				
Value Creation has submitted an environmental assessment report for the Advanced TriStar project.				
ATS-1	15,000	2016	Application	SAGD
ATS-2	30,000	2018	Application	SAGD
ATS-3	30,000	2020	Application	SAGD
TriStar				
Pilot	1,000	2014	Application	SAGD
COLD LAKE REGION — IN SITU				
BAYTEX ENERGY CORP.				
Cold Lake				
Baytex says it will build facilities and drill one SAGD well pair in 2013. Following successful operations of this pilot, the company will proceed with construction of the 5,000-barrel-per-day first commercial phase in 2014.				
Commercial	5,000	2015	Announced	SAGD
Pilot	1,200	TBD	Approved	SAGD
BIRCHWOOD RESOURCES INC.				
Sage				
Birchwood has released its public disclosure document and has held an open house with area residents, some of whom were concerned by the development.				
Pilot	5,000	2015	Announced	SAGD
CANADIAN NATURAL RESOURCES LIMITED				
Primrose & Wolf Lake				
Canadian Natural has completed additional pad drilling at Primrose on schedule and drilled on budget. These wells are expected to come on production in 2013.				
Primrose East	32,000	2008	Operating	CSS
Primrose North	30,000	2006	Operating	CSS
Primrose South	45,000	1985	Operating	CSS
Wolf Lake	13,000	1985	Operating	CSS

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
DEVON CANADA CORPORATION				
Walleye				
Devon filed its regulatory application for Walleye in June 2012. The company says construction will start in 2013.				
Phase 1	9,000	2016	Application	SAGD
HUSKY ENERGY INC.				
Caribou				
Demonstration	10,000	TBD	Approved	SAGD
Tucker				
Phase 1	30,000	2006	Operating	SAGD
IMPERIAL OIL LIMITED				
Cold Lake				
Imperial says that the Nabiye expansion is progressing on schedule. Facility construction is underway and drilling has commenced on two production pads.				
Phase 1-10	110,000	1985	Operating	CSS
Phase 11-12	30,000	2002	Operating	CSS
Phase 14-16	40,000	2014	Construction	CSS
OSUM OIL SANDS CORP.				
Taiga				
Osum received regulatory approval for the 35,000-barrel-per-day Taiga project. The company says it is now considering financing options.				
Phase 1	23,000	2016	Approved	SAGD
Phase 2	22,000	2017	Approved	SAGD
PENGROWTH ENERGY CORPORATION				
Lindbergh				
Pengrowth's board of directors has committed $55 million for critical path-related, long-lead equipment for the Lindbergh project thanks to encouraging pilot performance. More details on the timing and scope of the commercial project are expected early in 2013.				
Phase 1 Commercial	12,500	2015	Application	SAGD
Phase 2 Commercial	17,500	2016	Announced	SAGD
Pilot	1,200	2012	Operating	SAGD
ROYAL DUTCH SHELL PLC				
Orion				
Shell is looking to sell the Orion property, reportedly to focus on in situ operations at Peace River.				
Phase 1	10,000	2007	Operating	SAGD
Phase 2	10,000	TBD	Approved	SAGD
PEACE RIVER REGION — IN SITU				
ANDORA ENERGY CORPORATION				
Sawn Lake				
Andora Energy majority owner Pan Orient Energy says activities are currently underway to commence steam injection at Sawn Lake in Q2/2013, with production anticipated in Q4/2013.				
SAGD Demonstration	1,400	2013	Approved	SAGD
BAYTEX ENERGY CORP.				
Cliffdale				
Subject to regulatory approvals, Baytex anticipates development of a new 15-well thermal module to begin in Q1/2013, building on the 10-well module that has been operating since December 2011.				
Pilot	1,900	2010	Operating	
MURPHY OIL COMPANY LTD.				
Cadotte				
Pilot	TBD	TBD	Application	
Seal/Cadotte				
Pilot	TBD	2012	Operating	
NORTHERN ALBERTA OIL LTD.				
Sawn Lake				
Company owner Deep Well Oil & Gas says WorleyParsons has launched preliminary engineering work on the Sawn Lake pilot project. The work will include a pilot plan, process flow diagrams, material balances for hydrocarbons, sulphur and water, description of the capacity and content of emissions.				
CSS Pilot	700	TBD	Approved	CSS

CURRENT PROJECT	CAPACITY	START-UP	REGULATORY STATUS	TECHNOLOGY
PENN WEST PETROLEUM LTD.				
Harmon Valley South				
Penn West and its partner have received regulatory approval to proceed with the Harmon Valley South pilot.				
Pilot	TBD	TBD	Approved	CSS
Seal Main				
Commercial	10,000	2015	Application	CSS
Pilot	75	2011	Operating	CSS
PETROBANK ENERGY AND RESOURCES LTD.				
Dawson				
Petrobank says it is awaiting regulatory approval to initiate cold production on its two-well demonstration project to condition the reservoir prior to THAI operations.				
Experimental THAI Demonstration	10,000	2013	Construction	THAI
Phase 2	10,000	TBD	Announced	THAI
ROYAL DUTCH SHELL PLC				
Peace River				
Alberta's environmental assessment director has deemed complete Shell Canada's environmental impact assessment report for the Carmon Creek expansion.				
Cadotte Lake	12,500	1986	Operating	CSS
Carmon Creek - Phase 1	40,000	2015	Application	CSS
Carmon Creek - Phase 2	40,000	2018	Application	CSS
SOUTHERN PACIFIC RESOURCE CORP.				
Red Earth				
Southern Pacific has yet to release its future development plans for the Red Earth project.				
Commercial	10,000	TBD	Announced	CSS
Pilot	1,000	2009	Operating	CSS
Pilot Expansion	3,000	TBD	Announced	CSS
NORTH ATHABASCA REGION — UPGRADER				
BP P.L.C.				
Terre de Grace				
BP says that ongoing appraisal activities include delineation drilling, seismic acquisition and appraisal of water sources.				
Pilot	8,400	TBD	Approved	Upgrader
CANADIAN NATURAL RESOURCES LIMITED				
Horizon				
Canadian Natural says it continues its strategy of staged expansion to 250,000 barrels per day and work remains on track. Projects currently under construction are trending at or below estimates.				
Phase 1	114,000	2009	Operating	Upgrader
Phase 2A	10,000	2014	Construction	Upgrader
Phase 2B	45,000	TBD	Approved	Upgrader
Phase 3	80,000	TBD	Approved	Upgrader
Tranche 2	5,000	2012	Operating	Upgrader
IVANHOE ENERGY INC.				
Tamarack				
Ivanhoe is responding to a third round of supplemental information requests from regulators regarding its project application. Approval is now anticipated in 2013.				
Phase 1	34,784	2016	Application	Upgrader
SUNCOR ENERGY INC.				
Base Operations				
Suncor says it has started up its new Millennium Naphtha Unit and has run it at full rates. The unit is expected to stabilize secondary upgrading capacity and provide flexibility during maintenance activities for secondary upgrading units in the future.				
Millennium Coker Unit	97,000	2008	Operating	Upgrader
Millennium Vacuum Unit	35,000	2005	Operating	Upgrader
U1 and U2	225,000	1967	Operating	Upgrader
Fort Hills				
Suncor and partner Total continue to review development timelines for Fort Hills.				
Phase 1	145,000	TBD	On Hold	Upgrader
Phase 2 & 3	145,000	TBD	On Hold	Upgrader
Voyageur Upgrader 3				
Suncor and partner Total have agreed to an immediate minimum-spend program on Voyageur. A go/no-go decision on the project is now expected in Q1/2013.				
Phase 1	127,000	2016	Approved	Upgrader
Phase 2	63,000	TBD	Approved	Upgrader
SYNCRUDE CANADA LTD.				
Mildred Lake/Aurora				
Syncrude has announced it is embarking on a new mine extension project at Mildred Lake, which will be known as the MLX project. Canadian Oil Sands says MLX will leverage investment in the two mine trains currently being constructed, enabling Syncrude to extend the life of Mildred Lake mining operations by about a decade. Project scoping is underway, and pending regulatory approval, construction and spending would commence in the next 10 years.				
Base Plant Stage 1 & 2 Debottleneck	250,000	1978	Operating	Upgrader
Stage 3 Debottleneck	75,000	TBD	Announced	Upgrader
Stage 3 Expansion (UE-1)	100,000	2006	Operating	Upgrader
SOUTH ATHABASCA REGION — UPGRADER				
NEXEN INC.				
Long Lake				
CNOOC's bid to acquire Nexen has been approved by the Canadian government and is expected to close imminently.				
Phase 1	58,500	2008	Operating	Upgrader
Phase 2	58,500	TBD	Approved	Upgrader
Phase 3	58,500	TBD	Application	Upgrader
Phase 4	58,500	TBD	Announced	Upgrader
VALUE CREATION INC.				
Advanced TriStar				
Value Creation has submitted an environmental assessment report for the Advanced TriStar project.				
ATS-1	12,750	2016	Application	Upgrader
ATS-2	25,500	2018	Application	Upgrader
ATS-3	25,500	2020	Application	Upgrader
TriStar				
Pilot	840	2014	Application	Upgrader
INDUSTRIAL HEARTLAND REGION — UPGRADER				
NORTH WEST UPGRADING INC.				
Redwater Upgrader				
Project partners North West Upgrading and Canadian Natural Resources have sanctioned the project, with above-ground construction to begin in spring 2013.				
Phase 1	77,000	2016	Approved	Upgrader
Phase 2	77,000	TBD	Approved	Upgrader
Phase 3	77,000	TBD	Approved	Upgrader
SHELL ALBIAN SANDS				
Scotford Upgrader 1				
Commercial	158,000	2003	Operating	Upgrader
Expansion	91,000	2011	Operating	Upgrader
VALUE CREATION INC.				
Heartland				
Construction was suspended in September 2008. Value Creation says it remains committed to the project and is seeking a development partnership.				
Phase 1	46,300	TBD	On Hold	Upgrader
Phase 2	46,300	TBD	Approved	Upgrader
Phase 3	46,300	TBD	Approved	Upgrader

Glossary of oil sands terms

API

An American Petroleum Institute measure of liquid gravity. Water is 10 degrees API, and a typical light crude is from 35 to 40. Bitumen is 7.5 to 8.5.

Barrel

The traditional measurement for crude oil volumes. One barrel equals 42 U.S. gallons (159 litres). There are 6.29 barrels in one cubic metre of oil.

Bitumen

Naturally occurring, viscous mixture of hydrocarbons that contains high levels of sulphur and nitrogen compounds. In its natural state, it is not recoverable at a commercial rate through a well because it is too thick to flow. Bitumen typically makes up about 10 per cent by weight of oil sand, but saturation varies.

Condensate

Mixture of extremely light hydrocarbons recoverable from gas reservoirs. Condensate is also referred to as a natural gas liquid, and is used as a diluent to reduce bitumen viscosity for pipeline transportation.

Cyclic steam stimulation (CSS)

For several weeks, high-pressure steam is injected into the formation to soften the oil sand before being pumped to the surface for separation. The pressure created in the underground environment causes formation cracks that help move the bitumen to producing wells. After a portion of the reservoir has been saturated, the steam is turned off and the reservoir is allowed to soak for several weeks. Then the production phase brings the bitumen to the surface.

Density

The heaviness of crude oil, indicating the proportion of large, carbon-rich molecules, generally measured in kilograms per cubic metre (kg/m^3) or degrees on the American Petroleum Institute (API) gravity scale; in western Canada, oil up to 900 kg/m^3 is considered light-to-medium crude—oil above this density is deemed as heavy oil or bitumen.

Diluent

See *Condensate*.

Established recoverable reserves

Reserves recoverable under current technology, and present and anticipated economic conditions, plus that portion of recoverable reserves that is interpreted to exist, based on geological, geophysical or similar information, with reasonable certainty.

Established reserves

Reserves recoverable with current technology, and present and anticipated economic conditions specifically proved by drilling, testing or production, plus the portion of contiguous recoverable reserves that are interpreted to exist from geological, geophysical or similar information with reasonable certainty.

Extraction

A process, unique to the oil sands industry, which separates the bitumen from the oil sand using hot water, steam and caustic soda.

Froth treatment

The means to recover bitumen from the mixture of water, bitumen and solids "froth" produced in hot water extraction (in mining-based recovery).

Gasification

A process to partially oxidize any hydrocarbon, typically heavy residues, to a mixture of hydrogen and carbon monoxide. Can be used to produce hydrogen and various energy by-products.

Greenhouse gases

Gases commonly believed to be connected to climate change and global warming. CO_2 is the most common, but greenhouse gases also include other light hydrocarbons (such as methane) and nitrous oxide.

Initial established reserves

Established reserves prior to the deduction of any production.

Initial volume in place

The volume calculated or interpreted to exist in a reservoir before any volume has been produced.

In situ

Latin for "in place." In situ recovery refers to various methods used to recover deeply buried bitumen deposits.

In situ combustion

A displacement enhanced oil recovery method. It works by generating combustion gases (primarily CO and CO_2) downhole, which then "pushes" the oil towards the recovery well.

Lease

A legal document from the province of Alberta giving an operator the right to extract bitumen from the oil sand existing within the specified lease area. The land must be reclaimed and returned to the Crown at the end of operations.

Muskeg

A water-soaked layer of decaying plant material, one to three metres thick, found on top of the overburden.

Oil sands

Bitumen-soaked sand, located in four geographic regions of Alberta: Athabasca, Wabasca, Cold Lake and Peace River. The Athabasca deposit is the largest, encompassing more than 42,340 square kilometres. Total deposits of bitumen in Alberta are estimated at 1.7 trillion to 2.5 trillion barrels.

Overburden

A layer of sand, gravel and shale between the surface and the underlying oil sand. Must be removed before oil sands can be mined. Overburden underlies muskeg in many places.

Pilot plant

Small model plant for testing processes under actual production conditions.

Proven recoverable reserves

Reserves that have been proven through production or testing to be recoverable with existing technology and under present economic conditions.

Reclamation

Returning disturbed land to a stable, biologically productive state. Reclaimed property is returned to the province of Alberta at the end of operations.

Remaining established reserves

Initial reserves less cumulative production.

Royalty

The Crown's share of production or revenue. About three-quarters of Canadian crude oil is produced from lands, including the oil sands, on which the Crown holds mineral rights. The lease or permit between the developer and the Crown sets out the arrangements for sharing the risks and rewards.

Steam assisted gravity drainage (SAGD)

An in situ production process using two closely spaced horizontal wells: one for steam injection and the other for production of the bitumen/water emulsion.

Synthetic crude oil (SCO)

A manufactured crude oil comprised of naphtha, distillate and gas oil-boiling range material. Can range from high-quality, light sweet bottomless crude to heavy, sour blends.

Tailings

A combination of water, sand, silt and fine clay particles that are a by-product of removing the bitumen from the oil sand.

Tailings settling basin

The primary purpose of the tailings settling basin is to serve as a process vessel allowing time for tailings water to clarify and silt and clay particles to settle, so the water can be reused in extraction. The settling basin also acts as a thickener, preparing mature fine tails for final reclamation.

Thermal recovery

Any process by which heat energy is used to reduce the viscosity of bitumen in situ to facilitate recovery.

Toe to heel air injection (THAI)

An in situ combustion method for producing heavy oil and oil sand. In this technique, combustion starts from a vertical well, while the oil is produced from a horizontal well having its toe in close proximity to the vertical air-injection well. This production method is a modification of conventional fire flooding techniques in which the flame front from a vertical well pushes the oil to be produced from another vertical well.

Truck-and-shovel mining

Large electric or hydraulic shovels are used to remove the oil sand and load very large trucks. The trucks haul the oil sand to dump pockets where it is conveyed or pipelined to the extraction plant. Trucks and shovels are more economic to operate than the bucket-wheel reclaimers and draglines they have replaced at oil sands mines.

Upgrading

The process of converting heavy oil or bitumen into synthetic crude either through the removal of carbon (coking) or the addition of hydrogen (hydroconversion).

Vapour extraction (VAPEX)

VAPEX is a non-thermal recovery method that involves injecting a gaseous hydrocarbon solvent into the reservoir where it dissolves into the sludge-like oil, which becomes less viscous (or more fluid) before draining into a lower horizontal well and being extracted.

Viscosity

The ability of a liquid to flow. The lower the viscosity, the more easily the liquid will flow.

CONTACTS

Oil Sands Producers

- **Alberta Oilsands** www.aboilsands.ca
- **Andora Energy** www.andoraenergy.com
- **Athabasca Oil Corporation** www.atha.com
- **Baytex Energy** www.baytex.ab.ca
- **BlackPearl Resources** www.blackpearlresources.ca
- **Canadian Natural Resources** www.cnrl.com
- **Cenovus Energy** www.cenovus.com
- **Chevron Canada** www.chevron.ca
- **China National Offshore Oil Corporation** www.cnooltd.com
- **Connacher Oil and Gas** www.connacheroil.com
- **ConocoPhillips Canada** www.conocophillips.ca
- **Devon Canada** www.dvn.com
- **Dover Operating Corp.** www.doveropco.com
- **Enerplus Resources Fund** www.enerplus.com
- **E-T Energy** www.e-tenergy.com
- **Grizzly Oil Sands** www.grizzlyoilsands.com
- **Harvest Operations Corp.** www.harvestenergy.ca
- **Husky Energy** www.huskyenergy.ca
- **Imperial Oil** www.imperialoil.ca
- **Ivanhoe Energy** www.ivanhoeenergy.com
- **Japan Canada Oil Sands** www.jacos.com
- **Koch Exploration Canada** www.kochind.com
- **Korea National Oil Corporation** www.knoc.co.kr
- **Laricina Energy** www.laricinaenergy.com
- **Marathon Oil** www.marathon.com
- **MEG Energy** www.megenergy.com
- **Nexen** www.nexeninc.com
- **North West Upgrading** www.northwestupgrading.com
- **N-Solv** www.n-solv.com
- **Oak Point Energy** www.oakpointenergy.ca
- **Occidental Petroleum Corporation** www.oxy.com
- **Oilsands Quest** www.oilsandsquest.com
- **OSUM Oil Sands** www.osumcorp.com
- **Pan Orient Energy** www.panorient.ca
- **Paramount Resources Ltd.** www.paramountres.com
- **Pengrowth Energy Trust** www.pengrowth.com
- **Petrobank Energy and Resources** www.petrobank.com
- **PetroChina** www.petrochina.com.cn/Ptr/
- **Shell Canada** www.shell.ca
- **Sinopec** english.sinopec.com
- **Southern Pacific Resource Corp.** www.shpacific.com
- **Statoil Canada** www.statoil.com
- **Suncor Energy** www.suncor.com
- **Sunshine Oilsands** www.sunshineoilsands.com
- **Syncrude** www.syncrude.ca
- **Talisman Energy** www.talisman-energy.com
- **Teck Resources** www.teck.com
- **Total E&P Canada** www.total-ep-canada.com
- **Value Creation Group** www.vctek.com

Associations/Organizations

- **Alberta Building Trades Council** www.buildingtradesalberta.ca
- **Alberta Chamber of Resources** www.acr-alberta.com
- **Alberta Chambers of Commerce** www.abchamber.ca
- **Alberta Energy** www.energy.gov.ab.ca
- **Alberta Enterprise and Advanced Education** www.eae.alberta.ca
- **Alberta Innovates** www.albertainnovates.ca
- **Alberta Environment and Sustainable Resource Development** www.srd.alberta.ca
- **Alberta's Industrial Heartland Association** www.industrialheartland.com
- **Canada's Oil Sands Innovation Alliance** www.cosia.cs
- **Canadian Association of Geophysical Contractors** www.cagc.ca
- **Canadian Association of Petroleum Producers** www.capp.ca
- **Canadian Heavy Oil Association** www.choa.ab.ca
- **Canadian Oil Sands Network for Research and Development** www.canadianoilsandsnetwork.ca
- **Energy Resources Conservation Board** www.ercb.ca
- **In Situ Oil Sands Alliance** www.isuta.ca
- **Lakeland Industry and Community Association** www.lica.ca
- **Natural Resources Conservation Board** www.nrcb.gov.ab.ca
- **Oil Sands Developers Group** www.oilsandsdevelopers.ca
- **Oil Sands Secretariat** www.energy.alberta.ca
- **Petroleum Technology Alliance Canada** www.ptac.org

For more information, visit us at

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